Quick guide

HIV

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What is it? Human immunodeficiency virus, a retrovirus that causes acquired immune deficiency syndrome (AIDS) in humans. There are two main types, HIV-1 and HIV-2, as well as a simian virus (SIV) that causes AIDS in macaque monkeys.

Also known as… the AIDS virus.

Why all the fuss about HIV? There are currently more than 35 million people infected with HIV. In 1998, 2.3 million people died of AIDS worldwide, twice as many as the year before.

Where did it come from? HIV-1 probably came from chimpanzees in Africa and HIV-2 from West African Sooty mangabey monkeys.

So does HIV really cause AIDS? Peter Duesberg, an eminent virologist, has made headlines by claiming it doesn't. He pushes the view that AIDS is caused by drug abuse and by AZT, an antiretroviral drug that has been used for years to treat HIV-infected people.

Is there any substance to Duesberg's argument? No.

Seriously, though, what is the evidence that HIV causes AIDS? HIV can be detected in virtually everybody with AIDS and HIV fulfils Koch's postulates — microbiology's gold standard — as the cause of AIDS.

What HIV research is in vogue at the moment? Triple-drug 'combination' therapy (see below) and HIV coreceptors. It was known 10 years ago that HIV needs CD4, a cell-surface receptor, to gain entry into cells, but it was also clear that CD4 is not enough: the virus needs a second cell-surface molecule before it can infect and kill a cell. Two years ago the chemokine receptors CCR5 and CXCR4 were identified as the coreceptors used by HIV isolates that infect macrophages and T-cell lines, respectively. Now eight more related molecules have been added to the list.

So is there much published about HIV? There have been more than 70,000 papers on HIV in the past 10 years.

Is there a cure for AIDS? Not yet. Until two years ago there was really no way of controlling AIDS except to treat the opportunistic infections that occur mainly as a result of the progressive loss of 'memory' CD4-bearing T lymphocytes. A dramatic advance has been the development of highly active anti-retroviral treatment (HAART), a combination of drugs — such as inhibitors of proteases and reverse transcriptase — that inhibit different stages of the viral life cycle. HAART greatly decreases plasma HIV-1 RNA concentrations and increases numbers of $CD4^+$ T cells, even in patients with advanced disease. It can stop AIDS progression, diminish opportunistic infections and reduce death rates. But many patients cannot tolerate HAART long-term, and about 90% of infected people live in countries that cannot afford such costly drug therapies.

Are some people genetically resistant to HIV infection? Yes… at least, to some strains. Some individuals who remain uninfected despite exposure to HIV are homozygous for a deletion in the CCR5 coreceptor gene; but a small number of such individuals have become infected with HIV strains that use CXCR4 as their coreceptor.

Is there cause for hope? Glaxo Wellcome has announced that it will provide AZT at substantially reduced cost to HIV-positive pregnant women in the developing world. This should help reduce the estimated 550,000 infections from mother to child each year. In a 1994 clinical trial, an AZT regimen given to pregnant, non-breastfeeding HIV-positive women reduced the risk of perinatal HIV transmission by almost 70%.

Can HAART eradicate HIV? With a combination of at least three drugs, it is unlikely that a virus will emerge that is resistant to all three drugs simultaneously — but it is still possible. The drugs are only effective against virus that is replicating, and not against virus resting in latently infected cells — some of which, such as brain cells, are long-lived and remain a potential source of virus for many years. HIV survives an immune onslaught from the moment of transmission, so there is little optimism for a strategy of stimulating the immune system to finish the virus off. Clearly, a vaccine is needed.

What is the difficulty in producing a vaccine? HIV is notoriously variable (each individual harbours a distinct population of viruses), especially in the envelope protein, the target for neutralising antibodies. Also, it is not known which arm of the immune system — cytotoxic T lymphocytes or neutralising antibodies — is most effective at eliminating HIV. There is no small-animal model for HIV infection, to help in evaluating vaccines. Several candidate vaccines will soon be clinically tested but there is little evidence so far of efficacy.

Don't say… HIV doesn't cause AIDS. It really does.

Do say… Use a condom! Preventing HIV transmission remains the most reliable method of controlling AIDS.

Where can I find out more?

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